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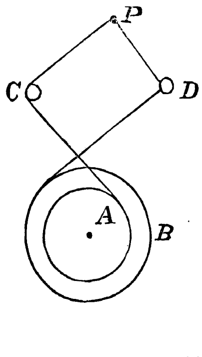
II.

On the Mechanical Description of the Cartesian.

BY J. HAMMOND, *Bath, England.*



Suppose two thin circular discs A, B rigidly attached to each other and capable of revolving round a pin through their common centre; [or perhaps it would be better to make the pin and discs revolve together.] Suppose also that fine strings, ACP, BDP, are wrapped round the discs and either passed through small rings at C, D, or twisted once round small pins there, and then knotted together at P, where a tracing point is attached.

Then it is evident that (if $CP = r$, $DP = r'$) $dr : dr' =$ ratio of the radii of A and B, and that P traces out a Cartesian, with two of its foci at C and D. When $A = B$ and one of the strings is wound on to the circle while the other is wound off, the locus of P is of course an ellipse, but when both are wound off together the locus is an hyperbola.

A simple construction for the tangent to the Cartesian at P is obtained by constructing a parallelogram of velocities, whose diagonal will be the tangent, the sides being measured along PC, PD proportional to the resolved velocities of P in those directions, *i. e.* to the radii of A and B.

III.

A New Solution of Biquadratic Equations.

BY T. S. E. DIXON, *Chicago, Ills.*

Reducing the given equation to the general form, $y^4 + 2py^2 + 8qy = r$, let $y = x + \sqrt{-\left(p + x^2 + \frac{2q}{x}\right)}$ and make the substitution. It will result in the cubic, $x^6 + px^4 + \frac{p^2 + r}{4}x^2 = q^2$, from which the values of x and consequently of y are readily obtained. Let $x = \sqrt{n}$, and the four values of y are

$$y = \sqrt{n} + \sqrt{-\left(p + n + \frac{2q}{\sqrt{n}}\right)}, \qquad y = -\sqrt{n} + \sqrt{-\left(p + n - \frac{2q}{\sqrt{n}}\right)},$$

$$y = \sqrt{n} - \sqrt{-\left(p + n + \frac{2q}{\sqrt{n}}\right)}, \qquad y = -\sqrt{n} - \sqrt{-\left(p + n - \frac{2q}{\sqrt{n}}\right)}.$$